

Segment 4

Remembering that Thomas Edison said, “Genius is one percent inspiration and ninety-nine percent perspiration,” the tree house detectives decide not to give up on their invention despite all the problems. They decide to contact John Del Frate of NASA Dryden Flight Research Center at Edwards, California, to learn more about testing. The tree house detectives decide to do a little more testing and finally come up with an invention that works! They head to Dr. D’s Lab to show off their invention and review the invention process. Dr. D encourages them to name their invention and tells the tree house detectives that they should protect their invention with a patent. To learn about patents, copyrights, intellectual property, trademarks, and trade secrets, the tree house detectives visit Ruth Nyblod at the U.S. Patent Office in Washington, DC. Back at the tree house, the detectives watch Mr. Textbook and decide to go to the Wright Brothers National Memorial at Kitty Hawk, North Carolina, where they speak with Ranger Darrell Collins. While there, the tree house detectives just happen to run into you know who—Orville and Wilbur Wright!

Objectives

The students will

- understand that scientific investigation involves asking and answering a question and comparing the answer with what scientists already know about the world.
- understand that scientists develop explanations by using observations.
- understand that scientists make the results of their investigations public.
- implement proposed solutions individually and collaboratively.
- communicate a problem, design, and solution, including oral, written, and pictorial communication of the design process and product.
- understand that people have always had problems and invented tools and techniques to solve problems.
- learn that scientists and engineers often work in teams.

Vocabulary

copyright - Protects the original expression of ideas, not the ideas themselves. It is free and automatically safeguards your original works of art, literature, music, films, broadcasts and computer programs from being copied and from certain other infringements.

intellectual property (IP) - IP represents the property of your mind or intellect. Types of intellectual property include patents, trademarks, designs, confidential information/trade secrets, copyrights, and so on.

inspiration - something that moves a mind to create

trademark - can be a letter, number, word, phrase, sound, smell, shape, color, logo, picture, aspect of packaging or any combination of these, which is used to distinguish goods and services of one trader from those of another

trade secret - Both a type of intellectual property (IP) and a strategy for protecting your IP. It includes proprietary knowledge (know-how) and other confidential information.

Video Component

Implementation Strategy

The NASA "Why?" Files is designed to enhance and enrich the existing curriculum. Full use of the video, resources, activities, and web site usually requires two to three days of class time per segment.

Before Viewing

1. Prior to viewing Segment 4 of *The Case of the "Wright" Invention*, discuss the previous three segments to review the problem and discover what the tree house detectives have learned about the invention process thus far. Use the problem board to help sort the information.
2. Review the list of issues and questions that the students revised and/or created prior to viewing Segment 4. Determine which, if any, were answered in the video or in the students' own research.

3. Focus Questions—Print the questions from the web site ahead of time to allow students time to copy them into their science journals. Remind students to look for the Focus Question icon as the answer to the focus question appears.

View Segment 4 of the Video

For optimal educational benefit, view *The Case of the "Wright" Invention* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. At the end of Segment 4, lead students in a discussion of the focus questions for segment 4 and record answers.
2. Have students discuss and reflect upon the



invention process, detailing how the process is similar to the scientific method.

3. Choose activities from the educator's guide and web site to reinforce concepts presented in the segment. The variety of activities is designed to enrich and enhance your curriculum.
4. Discuss the tree house detectives' final

Careers

pilot
patent attorney
park ranger
hang glider pilot
astronaut

"invention" and create a list of how the invention will help or not help make bicycles and their riders more visible at night. Discuss design changes that could be made to improve the invention.

5. Complete the Problem-Based Learning activity on the web site.
6. Have students reflect in their journals what they have learned about the invention process.
7. If a class invention contest was held, have students present their final product. Invite parents and other classes to view the displays and inventions. You may want to invite engineers, science teachers, or other professionals to judge the inventions to determine a winner. Also, visit the NASA "Why?" Files web site for additional information on the mentoring program offered by the American Institute of Aeronautics and Astronautics (AIAA).

Resources

Books

Baker, David: *Inventions from Outer Space*. Random House, 2000, ISBN: 0375409793

Griffiths, Nick: *Incredible Inventions*. World Book Inc., 1996, ISBN: 0716617382

Web Sites

U.S. Centennial of Flight Commission

The Centennial of Flight Commission web site is filled with information for aviation enthusiasts, educators, and students to celebrate the Wright Brothers' first powered flight centennial on and around December 17, 2003. This site will be updating information continually.
<http://centennialofflight.gov/>

Inventing Flight

Founded in 1989, this web site promotes aviation, the Wright brothers, and especially the role of Dayton, Ohio, in the birth and future of aviation. Drawing from the rich history of the Wright brothers, Inventing Flight will launch a once-in-a-lifetime event culminating in the Centennial Celebration in July 2003.
<http://www.inventingflight.com/>

NASA Online Educational Activities

Students explore NASA through guided research, building models, planning space food menus, or tracking a hurricane through the Caribbean. The activities are ready for use in the classroom or computer lab and require minimal teacher prep time. In *A Century of Firsts*, students will research facts about the history of spaceflight in the 20th century and answer questions about selected events.

<http://spacelink.nasa.gov/Instructional.Materials/Online.Educational.Activities/>

Young Inventors Awards Program

Craftsman and the National Science Teachers Association (NSTA) challenges students to use creativity and imagination along with science, technology, and mechanical ability to invent or modify a tool. Awards include \$250 to \$10,000 in Series EE savings bonds for students and various merchandise rewards for teachers. Deadline for entry is mid-March 2002.

<http://www.nsta.org/programs/craftsman/>

Wright Brothers National Memorial Park

National Park Service web site for the Wright Brothers National Memorial Park in Kill Devil Hills, North Carolina.

<http://www.nps.gov/wrbr/index.htm>

NASA Glenn Research Center—Re-Living the Wright Way

Have fun while learning about the Wright brothers process of invention at this web site from NASA's Glenn Research Center. Choose from simulations, web casts, videos, and activities. The simulations about the forces of flight are excellent.
http://www.grc.nasa.gov/WWW/Wright/

AIAA Evolution of Flight

Are you looking for a good overview of the 100-year history of flight? Do you want it to be specific to your country? This site has a "dynamite" "History of Flight" section. Also check out the "Click and Learn" page.
http://www.flight100.org

NASA Spacelink

This web site offers a complete listing of NASA materials and web sites. From Spacelink you can obtain Innovation Through Engineering, a NASA educational poster containing metric activities associated with the Wright brothers' flight

experiments. Activities include constructing and testing a sled kite, analyzing the data, and assembling a Metric Cube. The Process of Invention is another poster you will want to add to your collection. The poster traces the Wright brothers' story with examples of their experiments and inventions. It also contains an activity for constructing and testing a flying model glider.

U.S. Patent and Trademark Office Kids' Pages

Want to understand exactly what a patent is and how to get one? Did you know that the youngest patent-holder was a four-year-old girl? This site has some nifty information, games, and puzzles.
http://www.uspto.gov/go/kids/

Ippy Online

This web site from down under in Australia teaches children about innovations, inventions, and protecting good ideas through interactive games. Includes case studies, fact sheets, and lesson plans for teachers and lots of fun activities for students.
http://www.ippyonline.gov.au

Activities and Worksheets

In the Guide	3, 2, 1... Crash! Testing a Model	
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On the Web	Testing 1, 2, 3	
	Build and test an egg drop apparatus.	
	Invention Protection	
	Learn about intellectual property, patents, and much more.	

* Activities for invention contest booklet



3, 2, 1... Crash! Testing a Model

Purpose

Use measurement and ratios to perform test trials and predict outcomes of the trials.
Use graphing to organize data, interpret, and analyze results.

Teacher Prep

1. Use a small nail or sharp pen to puncture the center of the film canister or milk carton tops to create a small pilot hole for the wooden skewer.
2. Prepare the effervescent tablets in fractional sizes of one-half and one-fourth. To prepare the tablets, use the point of a sharp ink pen to score the top of the tablet by scratching a bisecting line across it and breaking along the line. Seal in a moisture proof container.
3. Optional: If graduated cylinders are not available for measuring, scratch the surface of a film canister or place tape at the appropriate location for 10 ml of water.

Procedure

1. Place the open end of the foam cup on a foam meat tray and trace.
2. Cut out the circle and tape it to the open end of the cup.
3. Cut a straw 7 cm long and tape the straw to the rim of the front end of the dragster. See figure 1.
4. Cut a second straw 13 cm long and tape the straw to the bottom of the back end of the cup so that the straws are parallel to each other and close to the rim at each end. See figure 2.
5. Thread a skewer through each straw and break off or cut the ends so that 2 to 3 cm of the skewer extend beyond the straw on each side.
6. Push a cap wheel onto the skewer on each side of the straw, leaving a small gap between each wheel and straw, thus allowing the wheels to roll.
7. Tape a straw to the bottom of the cup, perpendicular to the other two straws so that it extends about 4 cm beyond the wheel axle. See figure 3.

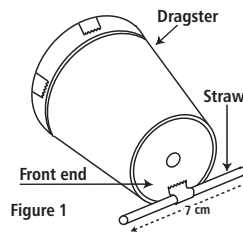


Figure 1

Materials

6-8 oz foam cup
foam meat tray (9 cm X 7 cm)
pen or marker
tape
3 straws
3 wooden skewers
4 round film canister tops or plastic milk carton tops
shoe box
scissors
Velcro® strip with adhesive back (5 cm X 3 cm)
masking tape
meter stick
effervescent antacid tablets
paper towels
water
graduated cylinder (optional)
safety goggles

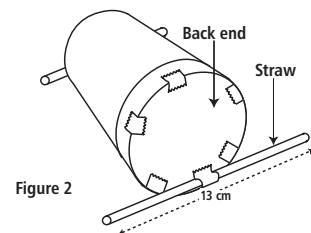


Figure 2

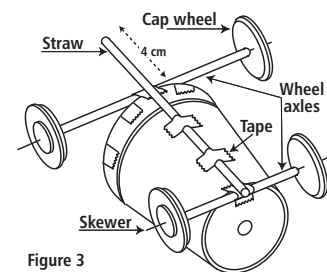


Figure 3

Propulsion Device

1. To construct the propulsion device, mark an "X" in the center of the end of the shoe box and glue a 5-cm section of Velcro® to the location of the "X." See figure 4.
2. Glue the opposing side of the Velcro® to the bottom of the film canister; trim as needed.
3. On the opposite end of the shoe box from the Velcro®, cut the back seams and pull down the flaps so that they lie flat.

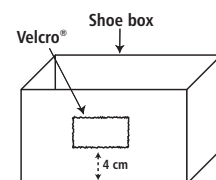


Figure 4

3, 2, 1... Crash! Testing a Model (continued)

4. Poke a skewer through the front end of shoe box close to the bottom of the box and centered directly beneath the Velcro® strip, extending the skewer about 12 cm beyond the edge of the box. See figure 5.

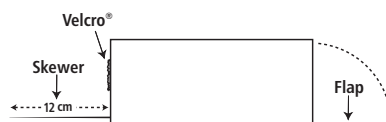


Figure 5

Test Track

1. To make the test track, cut two pieces of masking tape: one piece for the starting line (1 m long) and a second piece (5 m long) to measure the distance the dragster travels.
2. Place the masking tape at a right angle on the floor.
3. Mark the longest piece of tape in increments of decimeters.

Trials

1. Begin trials by placing the dragster behind the starting line.
2. Align the shoe box behind the dragster. Slide the skewer on the box into the straw on the bottom of the dragster.
3. Adjust the dragster and shoe box behind the starting line so that the wheels of the dragster align with "zero" on the marked tape.
4. Place your foot into the shoe box to hold it in place during the test. Adjust the box and dragster as needed. See figure 6.
5. PUT ON SAFETY GOOGLES. Fill the film canister with 10 ml of water and hold it near the front of the shoe box.
6. Predict how far the dragster will travel with one-fourth of a tablet added to the water. Record your prediction in journal.
7. Drop one-fourth tablet into the canister and snap on the cap.
8. Quickly attach the canister to the Velco® on the shoe box.
9. Position the dragster to rest against the film canister. STAND BACK DURING BLAST OFF.
10. Measure the distance that the dragster traveled (use the front wheels for mark) and record in journal.
11. Rinse and dry the canister.
12. Repeat steps 4-10 for a second trial of one-fourth tablet.
13. Find the average distance the dragster traveled for the two trials.
14. Repeat steps 4-10 with other ratios of tablets.
15. Graph results for each ratio.
16. Analyze your data and determine which ratio produced the greatest distance.

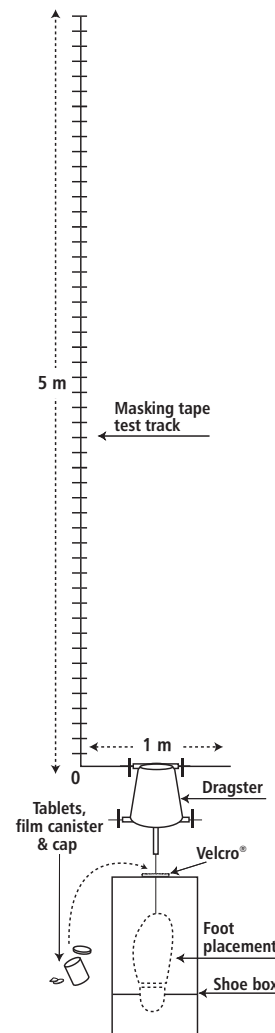


Figure 6

Extension

1. Construct a dragster from a soda can or plastic water bottle. Use vinegar and baking soda as a propulsion mixture. Begin with a ratio of 200 ml vinegar to 16 g baking soda.
2. Research aerodynamics. Design and construct a more aerodynamic dragster. Compare the test results with the results of the original dragster.

Trademarks

Purpose

To have a basic understanding of trademarks

Background

A trademark can be a letter, number, word, phrase, sound, smell, shape, color, logo, picture, aspect of packaging, or any combination of these that is used to distinguish goods and services of one trader from those of another. A small "TM" designates a trademark. When an inventor applies for a trademark, the TM designation is used as a superscript to the product name. Once the trademark has been registered, the superscript ® appears at the end of the product name. Example: VelcroTM, Velcro[®] <http://www.uspto.gov>

Materials

magazines
glue
scissors
construction paper
markers or crayons

Procedure

1. Find pictures of trademarks in the magazines and cut them out.
2. Position the trademarks onto a piece of construction paper and glue them on.
3. Use markers or crayons to fill in the gaps, repeat the logos, and so on.
4. In your own words on the back of your collage, define trademark.
5. Share your collage with your class.

Extensions

1. Design an original trademark for your invention or other product.
2. Use a computer program to design an original trademark.
3. Use your name and create an original trademark.
4. Look at various company logos such as Disney, Barbie, Nintendo, Lego, Pokemon, Apple Computers, and Visa. Create a company logo for an imaginary company you would like to own someday.

Copy Cat or Copyright?

Purpose

To explain copyright and recognize a copyright symbol

Background

Copyright protects the original expression of ideas, not the ideas themselves. It automatically safeguards your original works of art, literature, music, films, broadcasts, and computer programs from copying and certain other uses.

The copyright protects the form of expression rather than the subject matter of the writing. For example, a description of a machine could be copyrighted but would only prevent others from copying the description; it would not prevent others from writing a description of their own or from making and using the machine. Copyrights are registered by the Copyright Office of the Library of Congress. <http://lcweb.loc.gov/copyright/>

Materials

Haiku poetry samples
pencil
paper
art paper
markers or crayons

Procedure

1. Using the Internet or books, research the background of Haiku poetry.
<http://www.hsa-haiku.org>
<http://www.haiku.cc>
<http://www.tecnet.or.jp/~haiku>
2. Take turns in your group reading samples of Haiku poetry.
3. How many syllables are in the first line? Second line? Third line?
4. Discuss Haiku poetry and its purpose.
5. Write a Haiku poem and share it with your group for editing.
6. If necessary, revise your poem.
7. Discuss how to protect your original poem from someone copying your work.
8. Look in various books, newspapers, and magazines to find copyright information. What is the symbol that lets the reader know the material is copyrighted?
9. Copy your poem onto art paper and illustrate.
10. Place the copyright symbol (©), along with the year and your name, on your original work of poetry and art.



Naming Your Invention

You have an invention and now you need to name it. The name you give your invention is important. A creative name will show people how creative you are. A name can make people interested in your invention by catching their eye. The right name will even help people remember your invention for all time! Give it a lot of thought; however, an invention's name can be changed at any time.

There are many ways to name an invention. Below are some ideas to help you think about naming your invention. Read the examples and then put some thought into creating a name for your invention using each idea. After completing all the suggestions, choose the one you like best.

An invention is often named for what it is made of, for example: ice cream, popcorn, corn meal, rubber cement, shredded wheat, and down coat.

Possible name for your invention: _____

Inventions are sometimes named after the inventor, for example: Singer Sewing Machine, Morse Code, *Wright Flyer*, John Deere Tractor, Ford Truck, Heinz Ketchup, and Ferris Wheel.

Possible name for your invention: _____

Some inventions are named for their function (the way they work), for example: hair dryer, toothbrush, sunglasses, roller blades, hairbrush, screwdriver, space shuttle, and frying pan.

Possible name for your invention: _____

A funny or clever name will often make people remember an invention, for example: Silly Putty, Flip Flops, Beanie Babies, and Cool Whip.

Possible name for your invention: _____

Descriptive, rhyming names and abbreviations are also unique ways to name your invention, for example: VCR, TV, CD player, Rosy Posy, Curious George, and GI Joe.

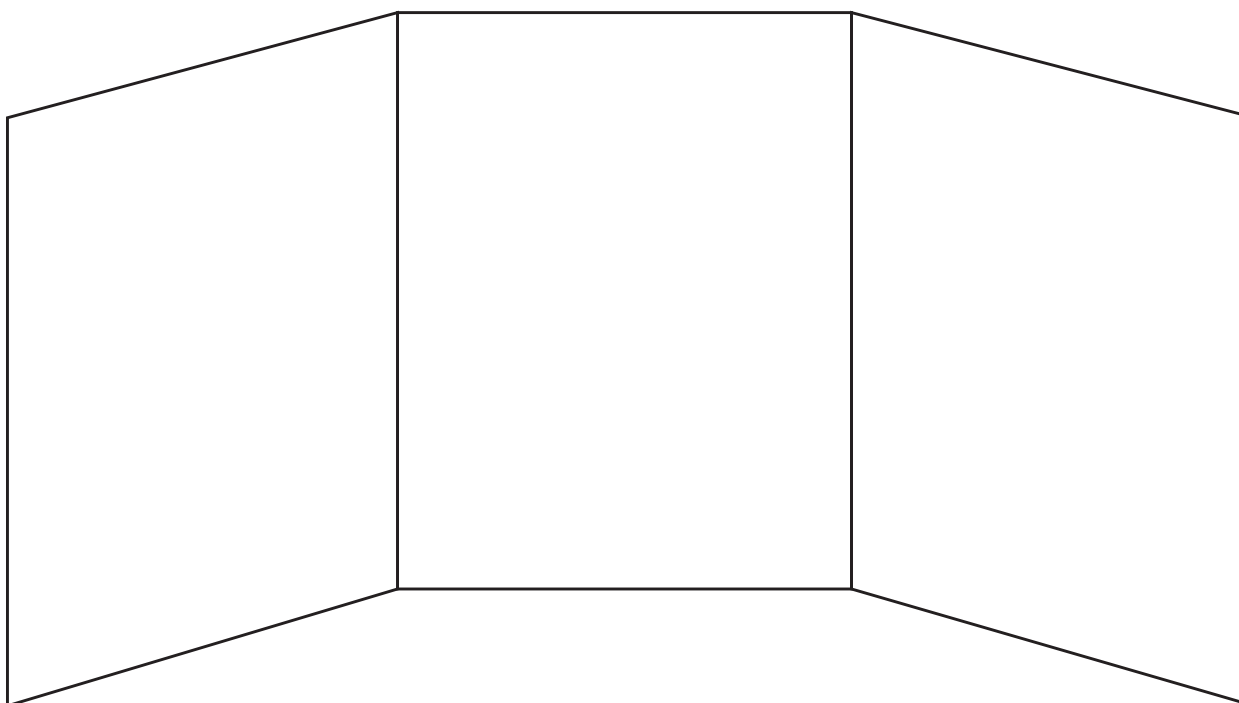
Possible name for your invention: _____

My invention's name is : _____

Displaying Your Invention

1. To display your invention, make a backboard or poster that outlines all the steps that you took during your invention process.
2. To make a backboard, use two pieces of poster board and cut one in half.
3. Tape the pieces you cut in half to the larger piece of poster board to form the side panels.
4. Design the layout of any photographs or illustrations that you want to include. Be sure to make the display bright and colorful.

Design Layout



5. On your display include the following:
 - your name
 - the title of your invention
 - the purpose of the invention
 - diagram of your invention with all parts labeled
 - an explanation of how your invention works
 - any photos or other information that would be useful to understand your invention
 - optional: biography of the inventor, jingles, advertisements, songs, or poems about your invention, and the results of your research
6. Set up your display, model, and inventor's log for all to enjoy!



The Incredible, Edible *Wright Flyer*

Purpose

To create a model of the Wright Flyer

Procedure

1. Following the perforations on the graham cracker, break one of them into four pieces. Set aside.

2. To build the wings of the plane:

Dip a pretzel into the frosting so that you have a small amount of frosting on both ends. The frosting will act as glue.

Place the pretzel in a perpendicular position on one corner of a full-sized graham cracker. Make sure that it is firmly attached by the frosting.

Continue to dip pretzels into the frosting and place them on the graham cracker, as shown in diagram 1.

Once you have all eight pretzels properly placed, put the second full-sized graham cracker on top. Press slightly to make sure that the frosting sticks.

3. To build the remaining section of the plane:

Break two pretzel sticks in half.

Dip both ends of one of the pretzels into the frosting.

Place the pretzel in a perpendicular position on a corner of one of the graham cracker sections that you set aside in step 1. Repeat with the other three pretzel halves. See diagram 2.

Once you have all four pretzels properly positioned, place a second graham cracker section piece on top. Press slightly to make sure that the frosting sticks.

4. To connect the two sections, dip two pretzels in frosting and attach the wings to the other section as shown. See diagram 3.

Materials

3 full-sized graham crackers
12-14 small pretzel sticks
frosting
paper plate

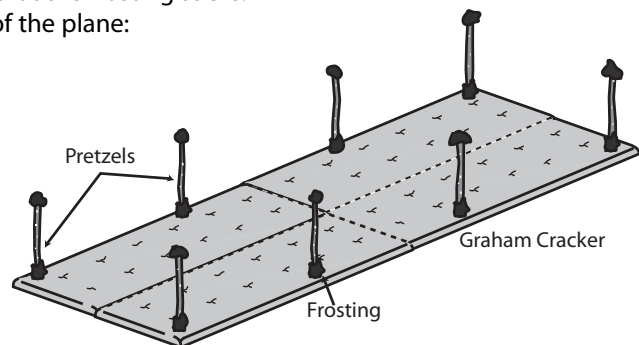


Diagram 1

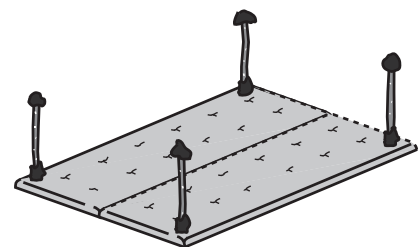


Diagram 2

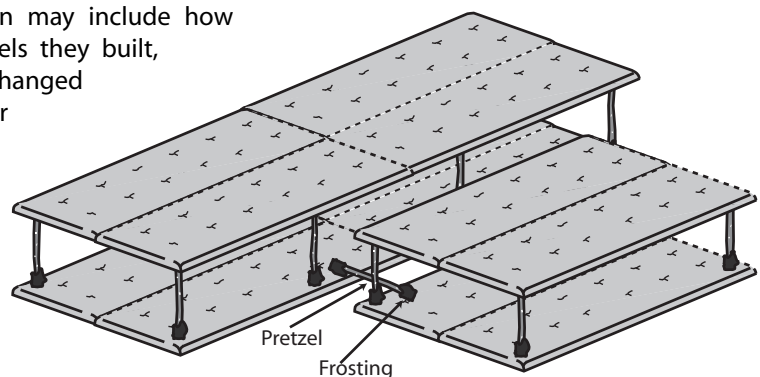


Diagram 3

Extension

Conduct an internet or library search for additional information on the Wright brothers' airplanes. Information may include how many different models they built, how their airplane changed with each model, or why they made changes to each plane.